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New Reports of Exotic and Native Ambrosia and Bark Beetle Species (Coleoptera: Curculionidae: Scolytinae) From Ohio

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NEW REPORTS OF EXOTIC AND NATIVE AMBROSIA AND BARK BEETLE SPECIES (COLEOPTERA: CURCULIONIDAE: SCOLYTINAE) FROM OHIO

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ABSTRACT

In a 2007 survey of ambrosia and bark beetles (Coleoptera: Curculionidae: Scolytinae) along a transect in northeastern Ohio, we collected six exotic and three native species not previously reported from the state. These species include the exotic ambrosia beetles *Ambrosiodmus rubricollis* (Eichhoff), *Dryoxylon onoharaensum* (Murayama), *Euwallacea validus* (Eichhoff), *Xyleborus californicus* Wood, *Xyleborus pelliculosus* Eichhoff, and *Xylosandrus crassiusculus* (Motschulsky). The native ambrosia beetle *Corthylus columbianus* Hopkins, and the native bark beetles *Dryocoetes autographus* (Ratzeburg) and *Hylastes tenuis* Eichhoff are also reported from Ohio for the first time. Our study suggests a northward range expansion for five of the six exotic species including, *X. crassiusculus*, which is an important pest of nursery and orchard crops in the southeastern United States.

Exotic ambrosia and bark beetles (Coleoptera: Curculionidae: Scolytinae) cause significant ecological and economic damage to trees in forests, urban landscapes, and nurseries throughout North America (Kühnholz et al. 2001, Oliver and Mannion 2001). As global trade has increased in recent years, so has the number of exotic scolytine beetles detected and established in North America (Haack 2006). In response to the growing threat of invasion by exotic ambrosia and bark beetles, the United States Department of Agriculture Forest Service, Forest Health Protection branch (USDA Forest Service) established an Early Detection and Rapid Response (EDRR) program in 2001 (USDA Forest Service 2006). The main objectives of the EDRR program are as follows: 1) to monitor high-risk areas to detect and track recently introduced scolytine species; and 2) to respond rapidly to these new infestations to allow time for eradication programs. Ohio was among the 19 states surveyed as part of the EDRR program in 2007. In the 2007 survey in northeastern Ohio, we caught six exotic ambrosia beetles that had previously been unreported in literature. We also document three native ambrosia and bark beetle species not previously reported from Ohio.

From April through September 2007, scolytine beetles were sampled along a transect extending across five counties (Geauga, Holmes, Medina, Summit, and Wayne) in northeastern Ohio (Fig. 1). Nine trapping sites were monitored including six tree nurseries, an arboretum, a major interstate highway rest-area, and a semi-urban forested area. These sites were chosen because they

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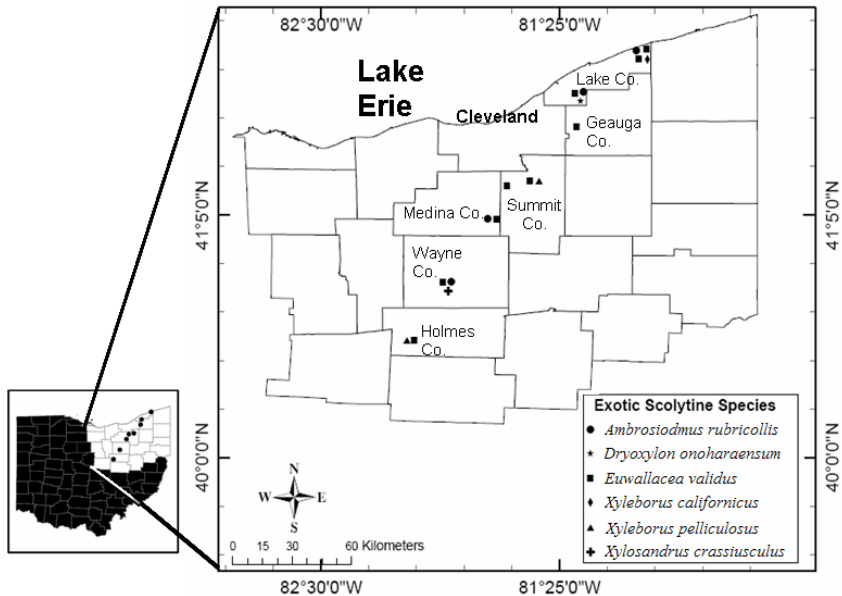


Figure 1. Map of Ohio showing location of detections of six exotic ambrosia beetles in 2007 Early Detection Rapid Response survey of northeastern Ohio. The symbols indicate locations of new species detected at each of the nine trapping sites (in some cases, there are multiple sites within a county).

are considered high-risk for importation, movement, or establishment of exotic species, and/or are in proximity to ports-of-entry on Lake Erie. Scolytine beetles were sampled with 12-unit Lindgren funnel traps with a wet collection cup (Lindgren 1983). The collection cup contained 4-5 cm of non-toxic antifreeze to kill insects. Traps were baited with the following three semiochemicals: 1) ultra high-release ethanol (400 mg/day; chemical purity > 98%); 2) ultra high-release (+)- α -pinene (2 g/day; chemical purity 99%) and ultra high-release ethanol; and 3) exotic *Ips* bait consisting of (\pm)-ipsdienol (27 μ g/day; chemical purity >95%), 2-methylbut-3-en-2-ol (30 mg/day; chemical purity >95%), and (\pm)-*cis*-verbenol (0.6 mg/day; 80% (-) enantiomer; chemical purity >95%) (Pherotech International Inc.; Synergy Semiochemical Corp.). Lures were changed every 60 days. Three funnel traps were placed in each of the nine sites for a total of 27 traps for the study. The three traps were placed on a linear transect along forest or woodlot edges, and were separated by > 25 m to reduce inter-trap interactions. Traps were deployed from April to September and emptied every 14 days. All adult scolytine beetles caught in the study were identified to species by AIC and were cross-referenced with scolytine literature for new records (e.g., Wood 1982, Wood and Bright 1992, Bright and Skidmore 1997, 2002, Rabaglia et al. 2006). Voucher specimens are deposited at the Museum of Biological Diversity, The Ohio State University, Columbus, Ohio. Collection data for each specimen in the following section includes county, latitude and longitude, the bait used to capture that species, collection date, and total number of specimens collected (indicated parenthetically at the end of the record) (Table 1).

Table 1. Summary of new state records of scolytine beetles caught as a part of the Early Detection Rapid Response (EDRR) survey of exotic bark beetles in northeastern Ohio in 2007.

Scolytine Beetle Species	Exotic/ Native	Bark/Ambrosia Beetle	Number of Adults Caught	Ohio Counties
<i>Ambrosiodinus rubricollis</i> (Eichhoff)	Exotic	Ambrosia	5	Lake, Medina, Wayne
<i>Corthylus columbianus</i> Hopkins	Native	Ambrosia	13	Holmes, Lake, Medina, Summit, Wayne
<i>Dryocoetes autographus</i> (Ratzeburg)	Native	Bark	645	Geauga, Lake, Medina, Summit, Wayne
<i>Dryoxylon onoharaensum</i> (Murayama)	Exotic	Ambrosia	1	Lake
<i>Euwallacea validus</i> (Eichhoff)	Exotic	Ambrosia	111	Geauga, Holmes, Lake, Medina, Summit, Wayne
<i>Hylastes tenuis</i> Eichhoff	Native	Bark	4	Geauga, Lake, Summit
<i>Xyleborus californicus</i> Wood	Exotic	Ambrosia	1	Lake
<i>Xyleborus pelliculosus</i> Eichhoff	Exotic	Ambrosia	3	Summit
<i>Xylosandrus crassiusculus</i> (Motschulsky)	Exotic	Ambrosia	2	Wayne

Exotic Scolytine Beetles***Ambrosiodmus rubricollis* (Eichhoff)**

USA: Ohio, Lake Co., N 41°49'25" W 81°03'03", N 41°36'37" W 81°18'57", (+)- α -pinene and ethanol, exotic *Ips* lure, 15.V.2007, 4.IX.2007 (2). Medina Co., N 41°04'09" W 81°44'10", ethanol, 27.VI.2007 (2). Wayne Co., 40°46'53" W 81°54'57", (+)- α -pinene and ethanol, 4.IX.2007 (1). *Ambrosiodmus rubricollis* is endemic to Asia and was first discovered in Maryland in 1968, and is now common throughout the southeastern United States. It has been reported from Alabama, Connecticut, Delaware, Florida, Louisiana, Maryland, Mississippi, Pennsylvania, South Carolina, Tennessee, and Virginia (Rabaglia et al. 2006). Common host species include *Carya* spp., *Cornus* spp., *Prunus* spp., and *Quercus* spp. (Wood 1982).

***Dryoxylon onoharaensum* (Murayama)**

USA: Ohio, Lake Co., N 41°36'37" W 81°18'57", (+)- α -pinene and ethanol, 15.V.2007 (1). This exotic species also is distributed throughout the southeastern United States, and has been detected in Delaware, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, and Texas (Bright and Rabaglia 1999, Coyle et al. 2005). There is little known about the biology of *D. onoharaensum*. The known host species include *Acer saccharum* Marsh., *Populus deltoides* Bartr. ex Marsh, and *Quercus* spp. This species appears to be expanding its range, and threatens to become a pest of increasing economic significance in both forested and urban landscapes (Bright and Rabaglia 1999).

***Euwallacea validus* (Eichhoff)**

USA: Ohio, Geauga Co., N 41°28'31" W 81°20'28", (+)- α -pinene and ethanol, ethanol, exotic *Ips* lure, 15.V.2007- 20.VIII.2007 (7). Holmes Co., N 40°30'17" W 82°6'53", (+)- α -pinene and ethanol, ethanol, 1-15.V.2007 (4). Lake Co., N 41°49'25" W 81°03'03", N 41°49'07" W 81°02'18", N 41°36'37" W 81°18'57", (+)- α -pinene and ethanol, ethanol, exotic *Ips* lure, 15.V.2007-27.VI.2007 (30). Medina Co., N 41°04'09" W 81°44'10", (+)- α -pinene and ethanol, ethanol, exotic *Ips* lure, 1.V.2007-7.VIII.2007 (18). Summit Co., N 41°14'03" W 81°31'35", N 41°12'41" W 81°40'01", (+)- α -pinene and ethanol, ethanol, exotic *Ips* lure, 1.V.2007-27.VI.2007 (49). Wayne Co., N 40°46'53" W 81°54'57", ethanol, exotic *Ips* lure, 1.V.2007, 20.VIII.2007 (3). An exotic Asian species, *E. validus* was first reported in North America from New York in 1976. This species is now common in the northeastern United States, and has been documented in Delaware, Louisiana, Maryland, New Jersey, New York, Pennsylvania, South Carolina, Virginia, and West Virginia (Rabaglia et al. 2006). Known host species include *Abies* spp., *Picea* spp., and *Populus* spp. (Wood 1982, Coyle et al. 2005). This species was caught in relatively high numbers in Ohio (111 individuals), and was present in all the six sampled counties (Figure 1).

***Xyleborus californicus* Wood**

USA: Ohio, Lake Co., N 41°49'07" W 81°02'18", ethanol, 15.V.2007 (1).

This palearctic species was first recorded in the western United States in 1944, and was not reported in the eastern United States until 2000 (Wood 1982, Vandenberg et al. 2000). It has been recorded from Alabama, Arkansas, California, Delaware, Florida, Kansas, Louisiana, Maryland, Mississippi, North Carolina, Oregon, South Carolina, Tennessee, Texas, Virginia, and Washington (Rabaglia et al. 2006). Hosts are unrecorded but individuals have been collected in *Pinus taeda* L. and *Populus* spp. stands (Fletcher et al. 1999, Coyle et al. 2005).

***Xyleborus pelliculosus* Eichhoff**

USA: Ohio, Summit Co., N 40°45'15" W 82°21'42", N 41°14'03" W 81°31'35", ethanol, 1.V.2007 (3). This Asian species was first reported in North America

in 1987 (Atkinson et al. 1990), and has been detected in Delaware, Maine, Maryland, Pennsylvania, Rhode Island, Tennessee, and Virginia (Rabaglia et al. 2006). There is no information about hosts or damage caused by this species in the United States, however hosts in Asia include *Acer* spp. and *Quercus* spp. (Haack 2006).

***Xylosandrus crassiusculus* (Motschulsky) (Granulate Ambrosia Beetle)**

USA: Ohio, Wayne Co., N 40°46'53" W 81°54'57", ethanol, 12-27.VI.2007 (2). The granulate ambrosia beetle is native to Asia and is especially prevalent in the southeastern United States. It has been recorded in Alabama, Delaware, Florida, Georgia, Hawaii, Indiana, Kansas, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Virginia (Rabaglia et al. 2006). *Xylosandrus crassiusculus* has dozens of hosts worldwide, including economically important plants such as *Asimina triloba* (L.) and *Pryus calleryana* Dene., as well as *Acer* spp., *Populus* spp., and *Quercus* spp. (Horn and Horn 2006). The granulate ambrosia beetle is also known to attack healthy and newly transplanted trees, especially in nurseries (Solomon 1995, Oliver and Mannion 2001). The presence of this species in Ohio represents a major northward range-extension. As *X. crassiusculus* is one of the major pest in southeastern states (Kovach and Gorsuch 1985), it's detection in Ohio is a cause for concern for the eastern nursery and orchard stocks.

Native Scolytine Beetles

***Corthylus columbianus* Hopkins (Columbian Timber Beetle)**

USA: Ohio, Holmes Co., N 40°30'17" W 82°6'53", (+)- α -pinene and ethanol, 15.V.2007 (1). Lake Co., N 41°49'25" W 81°03'03", N 41°36'37" W 81°18'57", (+)- α -pinene and ethanol, exotic *Ips* lure, 15.V.2007-10.VII.2007 (3). Medina Co., N 41°04'09" W 81°44'10", (+)- α -pinene and ethanol, ethanol, exotic *Ips* lure, 15.V.2007- 7.VIII.2007 (4). Summit Co., N 41°12'41" W 81°40'01", (+)- α -pinene and ethanol, ethanol, 24.VII.2007 – 7.VIII.2007 (3). Wayne Co., N 40°46'53" W 81°54'57", ethanol, 29.V.2007, 24.VII.2007 (2). The Columbian timber beetle is a North American bark beetle that has been recorded from Delaware, Florida, Georgia, Indiana, Kansas, Maryland, Massachusetts, Missouri, New Jersey, New York, North Carolina, South Carolina, Tennessee, Vermont, Virginia, Washington DC, and West Virginia (Wood 1982, Rabaglia and Valenti 2003). The host species include deciduous trees such as *Acer rubrum* L., *A. saccharinum* L., *Castanea dentata* (Marsh.) Borkh., *Liriodendron tulipifera* L., *Platanus occidentalis* L., *Quercus alba* L., and *Ulmus* spp. (Wood 1982). The Columbian timber beetle is economically important because it colonizes sapwood of healthy commercial trees, and can lower timber value by 25% (Solomon 1995).

***Dryocoetes autographus* (Ratzeburg)**

USA: Ohio, Geauga Co., N 41°28'31" W 81°20'28", (+)- α -pinene and ethanol, ethanol, 15.V.2007-4.IX.2007 (323). Lake Co., N 41°49'25" W 81°03'03", N 41°36'37" W 81°18'57", N 41°49'07" W 81°02'18", (+)- α -pinene and ethanol, ethanol, 15.V.2007-4.IX.2007 (223). Medina Co., N 41°04'09" W 81°44'10", (+)- α -pinene and ethanol, ethanol, 29.V.2007-4.IX.2007 (27). Summit Co., N 41°14'03" W 81°31'35", N 41°12'41" W 81°40'01", (+)- α -pinene and ethanol, 29.V.2007-4.IX.2007 (21). Wayne Co., N 40°46'53" W 81°54'57", (+)- α -pinene and ethanol, ethanol, 29.V.2007-4.IX.2007 (51). *Dryocoetes autographus* is native to North America with a transcontinental distribution. It has been recorded from Alaska, California, Colorado, Delaware, Idaho, Indiana, Maine, Maryland, Michigan, Minnesota, Montana, Nevada, New Hampshire, New Mexico, New York, North Carolina, Oregon, Pennsylvania, South Dakota, Tennessee, Utah, Virginia, Washington, West Virginia, Wisconsin, and Wyoming (Deyrup 1981, Wood 1982, Rabaglia and Valenti 2003). Due to its extensive distribution in the United States, it is surprising that *D. autographus* had not been previously

reported from Ohio. This species is typically found in the trunk and roots of dying trees and stems of fallen trees (Bright 1976, Wood 1982). Host species include *Abies* spp., *Picea engelmannii* Parry ex Engelm., *P. glauca* (Moench) Voss, *Pinus contorta* Dougl. ex Loud., *P. monticola* Dougl. ex D. Don, *P. strobus* L., *Pseudotsuga menziesii* (Mirb.) Franco, and *Tsuga heterophylla* (Raf.) Sarg. (Wood 1982).

***Hylastes tenuis* Eichhoff**

USA: Ohio, Geauga Co., N 41°28'31" W 81°20'28", (+)- α -pinene and ethanol, V.2007-VI.2007 (2). Lake Co., N 41°49'25" W 81°03'03", (+)- α -pinene and ethanol, 15.V.2007 (1). Summit Co., N 41°14'03" W 81°31'35", (+)- α -pinene and ethanol, 24.VIII.2007 (1). This North American bark beetle is especially abundant in the southern United States and has been recorded from Alabama, Arizona, Arkansas, California, Delaware, Washington DC, Florida, Georgia, Idaho, Indiana, Kentucky, Louisiana, Maryland, Massachusetts, Nevada, New Jersey, New Mexico, New York, North Carolina, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, and West Virginia (Wood 1982, Rabaglia and Valenti 2003). *Hylastes tenuis* is a rhizophagous species, colonizing roots of various *Pinus* spp. throughout its range (Wood 1982).

In our study, five of the six exotic species (*A. rubricollis*, *D. onoharaensum*, *X. californicus*, *X. crassiusculus*, and *X. pelliculosus*) were previously known to occur primarily in southern states. These state records suggest a northward range expansion of these exotic species. It has come to our attention that some of the exotic and native species reported in this study also have been collected in Ohio by Robert A. Haack (USDA Forest Service), Robert J. Rabaglia (USDA Forest Service), and E. Richard Hoebeke (Cornell University) who retain the relevant collection records (all personal communication). To our knowledge, our study represents the first detection of *X. crassiusculus* in Ohio which is significant, as this beetle is a serious economic pest of nursery and orchard crops in the southeastern states (Kovach and Gorsuch 1985, Oliver and Mannion 2001).

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